ADVANCED PRODUCTION & QUALITY MANAGEMENT

LESSON PLAN

Course Number: PQM 301

Module & Title: Lesson No. 1, Introduction to Analytical Tools

Length (total): 30 Minutes

Terminal Learning Objective:

Given the lecture/discussions a student will demonstrate an understanding of several functional tools associated with manufacturing and quality assurance.

Enabling Learning Objectives:

1. Identify several analytical tools for use during the design phase.

2. Identify several analytical tools for use during the production phase.

Learning Method: Lecture/Discussion

Student Readings: Teaching Note: "Manufacturing Questions Program Managers Should Ask"

Memory Jogger Plus

Background References: None

Conduct of the Lesson:

This lesson is conducted primarily by discussion/lecture and will introduce the analytical tools that will be used in an integrated exercise conducted during subsequent lessons.

MANUFACTURING QUESTIONS PROGRAM MANAGERS SHOULD ASK

Lt Col Robert Hartzell

and

Lt Col Dave Schmitz

The Acquisition Management Functional Board approved establishment of an assignment specific course for ACAT III program managers (PMs/DPMs), called the Program Managers Survival Course. The course was created to meet the special needs of ACAT III PMs, which include a different set of leadership and managerial challenges, and less depth of support than ACAT I and II PMs normally have. One of the areas covered in this two week survival skills course is manufacturing management. This first article in a series will discuss several design tools available to bring manufacturing considerations into the design process earlier, and risk reduction through the application of a quality system. Future articles will address other manufacturing topics of interest to the program manager.

WHAT IS MANUFACTURING

The term “manufacturing” covers a broad set of functional tasks required to harness all the elements needed to make a product. Included are such wide-ranging topics as the National Technology and Industrial Base (NTIB) capabilities to support the program, influencing the design for cost effective manufacturing, the people and skills needed, the selection of material, appropriate methods of production, capable machinery, scheduling, measurements, and quality assurance management systems. Manufacturing requires the support of functional specialties from a diverse set of organizations, to include matrix assigned manufacturing managers, other program office functionals, contract administration services people, laboratories, contractors, and commodity staffs as well as depot personnel.

Historically, 30 percent of a program’s total costs are consumed by production activities. Moreover, this significant investment is spent within a relatively short amount of time. Additionally, transitioning a system from development to production has also historically proven difficult, with attendant cost penalties. A Defense Science Board study reveals 30% of our production costs are non-value added (aka cost of quality, or the Hidden Factory).

WHAT’S NEW

Today’s acquisition realities offer new opportunities to reduce program risks, but they also pose some new challenges to program managers. From a manufacturing perspective, there are three important trends: DoD downsizing, acquisition reform, and technology improvements. Reduced requirements equates to fewer production programs and severe reductions in those programs that do go forward. The effect is a potential loss in critical skills required of design teams in terms of designing for production, and less experience for production planning, scheduling and controlling. Additionally, longer service lives and purchasing commercial off-the-shelf and nondevelopmental items (NDI) as a policy initiative will mean more ACAT III programs with unique risks accompanied by the challenges of reduced functional support and smaller staffs.

Acquisition reform also brings new opportunities and challenges to the PM world. More simplified contracting actions, increased reliance on commercial specifications and standards and less functional support bring significant opportunities to better integrate the National Technology and Industrial Base and make more of it available to meet DoD requirements. This adds other unique challenges: What is a “Best Commercial Practice”? How good is it? Will the contractor’s system meet my risk management needs?

Advances in information technology have enabled manufacturing management techniques to be implemented in an affordable and effective manner. Some of the tools described below (e.g. design of experiments) and producibility engineering and planning are easier to do with today’s computers and software. Their wide spread use can significantly reduce program risks.

DSMC MANUFACTURING MANAGEMENT CURRICULUM

We believe 80 percent of a manufacturing functional’s job is influencing the design and getting ready for production; toward that end, all of our curriculum is designed to convey current DoD policies, regulations, and management tools related to manufacturing in defense acquisition. This philosophy is equally valuable in the two week PM Survival Skills Course. In it, students will receive updates on the latest policies and initiatives impacting the manufacturing function. Additionally, students will be exposed to Best Practices being employed by world class producers in both the defense and commercial facilities of the NTIB. Based on this material, we have developed a set of questions any PM may want to ask of either the manufacturing functional or the development contractor.

SMART QUESTIONS TO ASK

Development Tools:

As mentioned above, we put a great deal of emphasis on the importance of influencing the design process for manufacturability. One way to do that is to implement Integrated Process and Product Development (IPPD), using Integrated Product Teams, or IPTs.(1) IPPD attempts to optimize the design, manufacturing, and supportability processes through the use of teams populated with appropriate functional area representatives who can concurrently perform required acquisition activities. IPTs are composed of representatives from all appropriate functional disciplines working together with a Team Leader to build successful and balanced programs, identify and resolve issues, and make sound and timely decisions. The purpose of IPTs is to make team decisions based on timely input from the entire team (e.g. program management, engineering, manufacturing, test, logistics, financial management, procurement, and contract administration) including customers and suppliers.

IPPD is working in the commercial market place, as well as in the defense industry. At Chrysler IPTs are called platform teams, and were used to develop the LH (mid-sized sedans) platform. Chrysler needed only 39 months versus the 54 months they had needed in the past to develop and launch the cars. The company used 740 engineers to work on the LH cars, compared to the 2000 used on earlier platforms. The factory where the LH cars were made needed just 3000 employees for full two-shift production, whereas earlier platforms had needed as many as 5,300. (2)

The first logical question to ask is, "*What engineering design tools used during development integrate manufacturing processes and affordabililty into the design?*" Fortunately, there are some tools available.

Quality Function Deployment (QFD). Programs in development face many risk drivers to cost, performance and schedule. One of those drivers is customer requirements, especially when those requirements keep changing, are soft, or are not fully or adequately developed. A core development task is the gathering of requirements and the translation of these requirements into technical solutions.(3) QFD is a planning process which uses multi-functional teams to get the voice of the customer into the design specifications. User requirements and preferences are defined and categorized as user attributes, which are then weighted based on importance to the user. Users are then asked to compare how their requirements are being met now by a fielded weapon system (or an alternative design approach) versus the new design. QFD provides the design team an understanding of customer desires (in clear text language), forces the customer to prioritize those desires, and compares/benchmarks one design approach against another. Each customer attribute is then satisfied by at least one technical solution. Values for those technical solutions are determined, and again rated among competing designs. Finally, the technical solutions are evaluated against each other to identify conflicts. A convenient form for viewing the ultimate product is the "house of quality" (Figure 1), which should help the design team translate customer attribute information into firm operating or engineering goals, and identify key manufacturing characteristics.

Design for "X" refers to a series of design approaches to achieve specific design-build objectives. DFX includes Design for Manufacture and Assembly (DFMA), Design for Recycling (DFR), etc. DFMA focuses specifically on defining product design options for ease of fabrication and assembly. The goal is to integrate the manufacturing engineer's knowledge of the factory floor (i.e. manufacturing processes), along with the use of design principles and rules, to develop a more producible product. Examples of the design rules include minimizing part count, using standard components, designing parts for ease of fabrication, and avoiding separate fasteners. DFMA can also provide secondary benefits by increasing reliability, reducing inventory, and shortening product development cycle time. Design for Recycling focuses specifically on achieving an optimization of recycling and reuse of materials at the end of a product's life cycle.

Design of Experiments (DOE). There are many factors that affect the quality of the end item. If our goal is to design and build quality into our products, we must control those factors that have the greatest impact on fit, performance, and service life. Most experimentation done today on the factory floor is done by accident. That is, manufacturing personnel first turn one knob (speed) up, and another knob (temperature) down in an attempt to bring product quality in line with specification requirements. They often change several factors at the same time and fail to collect, or analyze data. They are not understanding the process, they are just tampering with the system. DOE provides a structured way to characterize processes. A multi-functional team analyzes a process and identifies key characteristics, or factors that most impact the quality of the end item. Using DOE, the team runs a limited number of tests and data is collected and analyzed. The results will indicate which factors contribute the most to end quality, and will also define the parameter settings for those factors. Now, rather than tweaking or tampering with the system, production managers have the profound knowledge of their factory floor processes which allow them to build quality in, starting at the earliest stages of design.

How will management determine that equitable requirements tradeoffs are made between design and manufacturing processes during development?

The answer to this question will vary based on the phase of the acquisition program. At Preliminary Design Review for instance, our contractor should provide evidence of performing producibility analyses on development hardware trading-off design requirements against manufacturing risk, cost, production volume and existing capability/availability. Production planning demos should address material and component selection, preliminary production sequencing methods and flows concepts, new processes, manufacturing risk, facility/equipment usage for intended rates and quantities, and acceptance test and inspection concepts.

Cost as an independent variable requires increased focus on cost as an input to the design process. Design-to-cost goals should be established with the help of the manufacturing IPT. For example, an air superiority fighter program has a design-to-cost goal based on previous fighter programs, where 32% of life cycle costs are consumed in production. The manufacturing IPT's goal would be to reduce that number by some portion (e.g. 4%) while not penalizing O&S or R&D costs.

Of those manufacturing processes which do not exist or are unproved, what is planned to prove them out?

The primary way of doing this is by comparing program needs to work being done under the DOD's Manufacturing Science and Technology Program. The objective of this program is to develop or improve manufacturing processes, techniques, materials, and equipment to provide timely, reliable and economical production of defense systems.

Another way is to monitor service laboratories' technology investment plans and technology area planning. In either case, the goal is to ensure advanced manufacturing technologies are being considered by the contractor, the government, preferably both. We want to conduct process proofing as demonstrated in a factory representative environment before rate production begins.

Quality Systems

As noted above, DOD has relied in the past on specifications and standards to promote competition and to ensure high quality products or processes. Specifications and standards were easy to use and put on contract, and also eased the source selection process because buyers (especially for numerous low cost, commercially available items) could focus on cost versus quality. With today's emphasis on performance specifications and commercial standards, the program manager's best way to influence product quality is through implementation of a quality system.

How does the contractor plan to implement process control?

Implementation of a quality system is the best way to control processes. Elements of a basic quality system (e.g. ISO 9000) which contribute to process control include corrective and preventive actions, training, calibration of measurement and test equipment, nonconforming product control, control of purchased materials and components, use of statistical techniques, and use of internal audits.

I want to go beyond ISO 9000 to manage the risk on my program. What advanced quality concepts should I pursue?

Many of the tools and techniques already addressed would contribute to advanced quality. Another is the concept of Key Product Characteristics (KPCs). The identification of KPCs, their design limits, and the identification of key production processes and their capabilities are engineering tasks which support manufacturing development. The intent is to: identify those characteristics of the design which most influence performance, supportability, and cost (see the QFD discussion above); determine the production processes which effectively and affordably meets the product requirements; verify the capability of the processes; and develop the required process control for production.

Product variation is the silent killer on the factory floor. As KPCs vary from nominal, losses occur usually in the form of scrap, rework, or repair; if products are fielded, then losses include degraded performance, lower reliability and increased support costs, or upset customers. Once KPCs are identified, associated key processes can be evaluated for affordable maximization of process capability (Cpk), Figure 2. This implies further that a Process Control Plan be developed which ensures that required product quality is achieved at the lowest possible cost. Process Control Plans include the use of process control charts, statistical process control to differentiate common from special causes of variation, and gage variation studies to minimize errors in measurement.

How will development hardware be used to demonstrate fabrication, assembly, test and production processes?

Development hardware, while usually used to gauge initial compliance with specifications, should also be used to demonstrate manufacturing processes. At this stage in the acquisition life cycle (typically Product Definition and Risk Reduction or early EMD), manufacturing processes can be characterized as:

- Existing and capable-- Indicates little work is needed since quality requirements can be met by current manufacturing techniques.

- Existing but not capable-- Indicates the manufacturing process may be known, but not fully capable of meeting program rate, quality, or performance goals. This presents risk to the program; a plan needs to be developed to mature this technology, find a suitable alternative, or perhaps both.

- Nonexistent-- Development hardware was produced using techniques not transferable to the factory floor. This presents significant risk to the program; a plan needs to be developed to develop this technology, find a suitable alternative, or perhaps both.

How can continuous process improvement be incentivized?

One way is to use award fees based on reductions in the variance of KPCs, i.e. increase Cpks, without increasing costs of the end item/component. Another method is to use award fees or a savings sharing plan based on reduction in process costs that do not sacrifice performance or schedule.

FUTURE INSTALLMENTS

In this article we have looked at systemic changes in the acquisition environment which may impact defense manufacturing in particular. We started at the earliest stages of design, and described some of the tools available to the manufacturing functional to make that design more producible. In the quality section we covered some advanced quality tools, and saw again that a quality product in the end starts with the design.

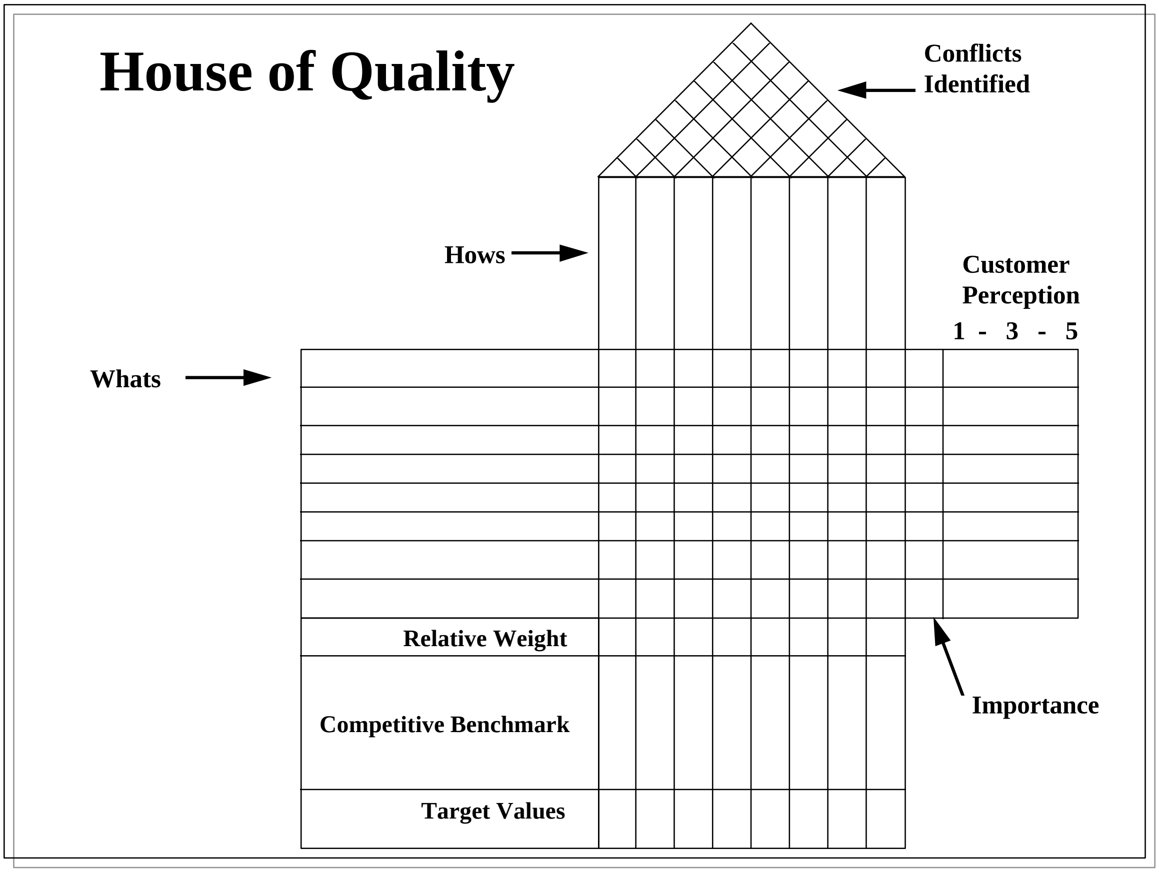
In the second installment of this series, we will look at lean as well as ‘green’ manufacturing. See you then!

Endnotes

1. Secretary of Defense letter, “Use of Integrated Product and Process Development and Integrated Product Teams in DoD Acquisition,” 10 May 95.
2. Ingrassia, Paul and White, Joseph B., “Shifting Gears,” *America West Airlines Magazine*, November 1994, p.52.

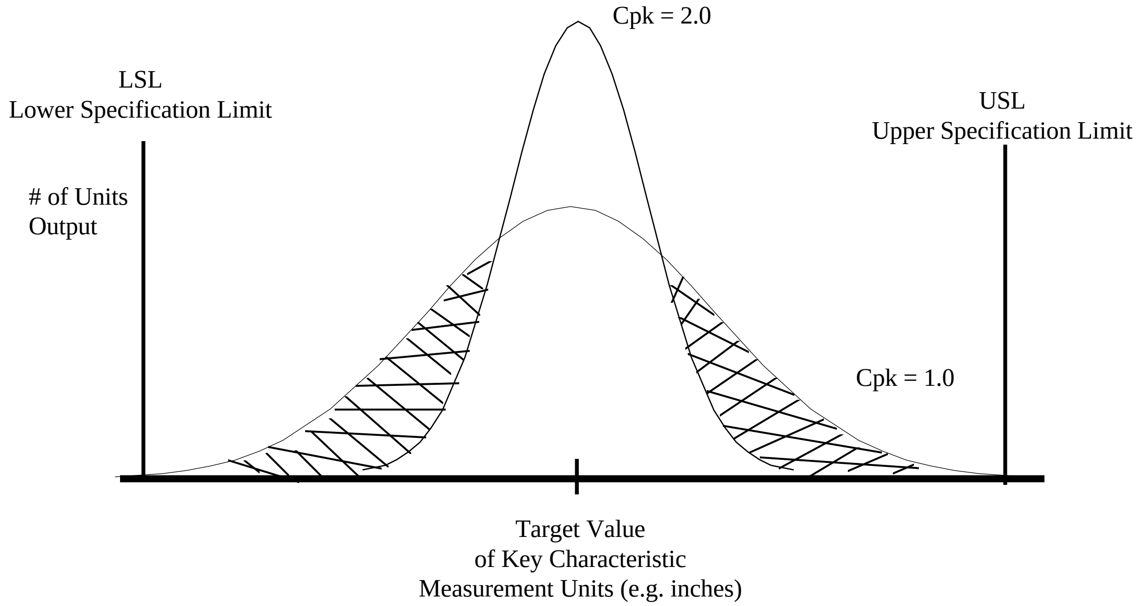
3. Lang, James D. and Hugge, Paul B., “Lean Manufacturing for Lean Times,” *Aerospace America*, May 1995, p.28.

Figure 1. House of Quality

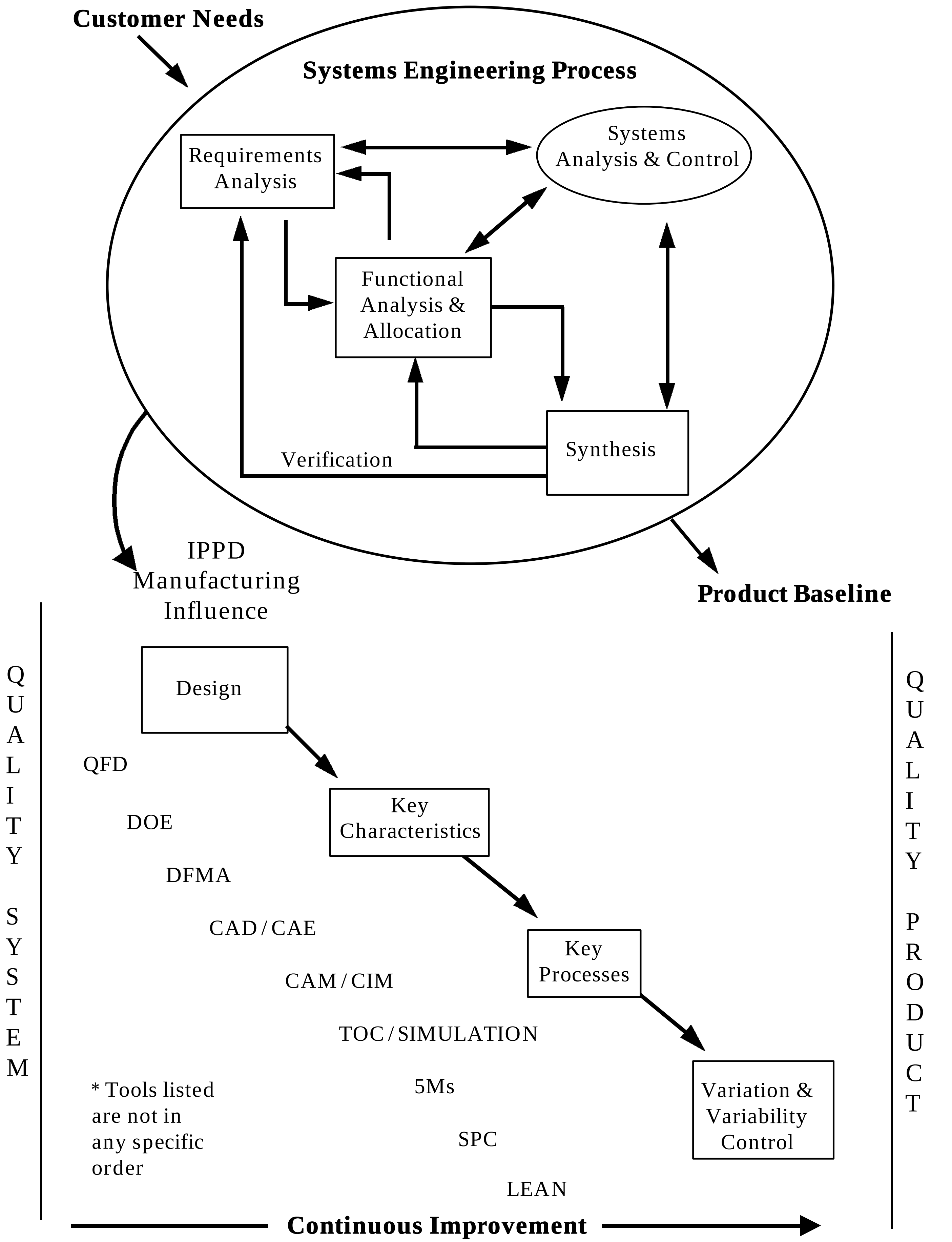


The QFD “house of quality” can be viewed as having two main parts. The first is the customer part, which is designed to allow customers to express needs in terms they understand. These needs usually are translated into a language the developer can use internally to describe and measure the item. For example, a customer requirement for a car door may be that it “closes easily.” The developer might translate that requirement into force measured in pounds. The second part of the “house” is the technical information section in which at least one technical solution is described for each customer need. A possible technical solution in this case may involve the type of latching mechanism selected.

Figure 2. Reducing Variation



Variation is the silent killer on the factory floor, because it can significantly impact product quality. Process capability (Cpk) is a unitless measure of product quality based on the normal distribution of product output around the nominal or target value. (Note: Process capability calculations can be made for other than normal distributions.) Both processes are within specification limits. But minimizing variation, especially for key characteristics is usually beneficial. Problems that occur with products falling in the cross-hatched areas include degrades performance, increased support costs, and higher product rework rates.


Customer Needs
Systems Engineering Process
Requirements Analysis
Systems Analysis & Control
Functional Analysis & Allocation
Synthesis
Verification
IPPD Manufacturing Influence
Product Baseline
QUALITY SYSTEM
Design
QFD
DOE
DFMA
CAD / CAE
CAM / CIM
TOC / SIMULATION
5Ms
SPC
LEAN
Key Characteristics
Key Processes
Variation & Variability Control
* Tools listed are not in any specific order
QUALITY PRODUCT
Continuous Improvement

ANALYTICAL TOOLS

- Quality Function Deployment
  - A planning process using IPPD
  - Understand ‘voice of customer’
  - Translate ‘voice’ into high level system requirements and product specifications
  - Prioritize requirements

ANALYTICAL TOOLS

- CAD/CAE
  - Modeling-- 3D parts representation
  - FEA-- Mechanical, electrical, fluids, etc. engineering analysis
  - Simulation-- System operation at subsystem and above levels
  - BOM-- Materials and manufacturing operations

ANALYTICAL TOOLS

- Design for Manufacturing and Assembly
  - Defining product design options for ease of fabrication and assembly
  - Rule based design
  - End product is quantified design efficiency

ANALYTICAL TOOLS

- Design of Experiments
  - Structured, economical experimentation
  - Used to develop robust designs
  - Used to develop robust processes through identification of process parameters and settings that lead to superior product characteristics

ANALYTICAL TOOLS

- 5Ms
  - Manpower
  - Machines
  - Methods
  - Measurement
  - Materials

ANALYTICAL TOOLS

- Lean Manufacturing
  - Lean design-- Integrated (multi-functional) product design and manufacturing processes
    - Customer integration in design process
  - Closer and long term relationships with suppliers beginning during design
  - Minimize inventories
  - Process quality control versus inspection

ANALYTICAL TOOLS

- Theory of Constraints
  - Controls production resources through identification of bottlenecks
    - Bottlenecks are resources whose capacities are less than the demand placed on them
  - Goals are to increase throughput, decrease inventory and decrease operating expense

ANALYTICAL TOOLS

- Theory of Constraints (cont’d)
  - 5 step process
    - Identify constraint
    - Maximize output of the constraint
    - Subordinate everything to the constraint (idle time is okay on unconstrained resources)
    - Add resources to the constraint to increase throughput
    - Identify next constraint

ANALYTICAL TOOLS

- Statistical Process Control
  - A way of understanding variation from nominal of key product characteristics
    - Examples are length, width, hardness, etc.
  - Two kinds of variation are common and special
  - Allows management decisions to be made based on profound knowledge of process identity and predictability of output

ADVANCED PRODUCTION & QUALITY MANAGEMENT

LESSON PLAN

Course Number: PQM 301

Module & Title: Lesson No. 2, New Paradigms

Length (total): 2 Hours

Terminal Learning Objective:

Given the lecture, discussions, and exercise the student will be able to define the impact of a changing acquisition reform, quality, and systems engineering paradigms on the DoD acquisition community. This lesson provides students with the opportunity to discuss new paradigms that should be affecting the way they do business. The new paradigms targeted in this lesson include acquisition reform, new quality definitions, and IPPD paradigms. Students will discuss the impact of these changing paradigms as they relate to the acquisition community.

Enabling Learning Objectives:

1. Relate the "new way of doing business" as set forth by USD (A&T) and USD (Acquisition Reform).

2. Compare the old and the new quality paradigms. The students will identify the new emerging paradigm for quality. They will then compare and contrast that paradigm with the old one. Basically we are going from inspecting quality to designing and building it in. Students will use this time to develop their own definitions for quality.

2. Identify the impacts of the new IPPD paradigm on Mfg/QA. The students will identify the new paradigm for systems engineering (IPPD). Discuss and contrast sequential engineering with IPPD concepts.

Learning Method: Lecture/Discussion/Exercise

Student Readings: DoD Deskbook, “Quality,” Section 2.6.E

Background References: Quest for Quality, Roger Hale, The Tennant Company, Minneapolis, MN

Conduct of the Lesson:

This lesson is conducted primarily by discussion and some lecture as appropriate. The TLO is accomplished in two major parts - The Development of the New Quality Paradigm, The Development of the New Engineering Paradigm.

The section on Developing New Quality Paradigms takes students through discussions of numerous definitions of quality. Some of these definitions reflect the old paradigm (acceptable quality levels) and some of the definitions will reflect the new paradigm (perfect 1st time quality). Students will develop their own definition of quality that will be used in the RFP exercise to drive contractor behavior to reduce cost while improving quality.

The second section takes students through an analysis of the changing paradigm within the engineering community. Classic engineering models have the engineers working in near vacuums to develop products that meet performance and test requirements. Once they meet those requirements the design is thrown over the wall to manufacturing that has to build to print. The problem is that the design is not producible. The new paradigm has design engineering working very closely with all the other functional areas, especially the technical areas. The goal is to create a design that meets performance requirements while optimizing the ease and economy of fabrication, assembly, test, maintenance, reliability, supportability, environmental, safety and health (ESH), affordability, et. al.

Defense Acquisition Deskbook, Section 2.6.E

Quality

Description

Quality products and services are fundamental to successful military operations, as well as to successful system development and production. The quality of products, or services is determined by the extent they meet (or exceed) requirements and satisfy the customer(s) at an affordable cost. The goal of an effective acquisition program is to acquire goods and services that meet or exceed DoD requirements, better, faster, and at less cost. The emphasis and practices to achieve quality have evolved dramatically in recent years. The major shift in defense acquisition is to emphasize development of quality products through design of the product and its associated processes. The key to success here is to prevent quality problems through sound processes, not to find them later and do rework.

File Owner: Richard Aggers, OUSD(A&T)DTSE&E/DDSE
Phone: (703) 695-3200
Email: aggersra@acq.osd.mil
File Last Reviewed: Feb 98

Mandatory References

Federal Acquisition Regulation
FAR Part 46, "Quality Assurance"

Defense Federal Acquisition Regulation Supplement
DFARS Part 246, "Quality Assurance"

Defense Logistics Acquisition Regulation
DLAR 46 Quality Assurance

DoD Directive 5000.1, Defense Acquisition, March 15, 1996
Para.D.2., "Acquiring Quality Products"

DoD 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs, March 15,1996
Part 4.3.2, "Quality"

AF Policy Directive 63-5; Quality Assurance; 7 September 1993

AF Instruction 63-501; Air Force Acquisition Quality Program; 31 May 1994

File Owner: Frank Doherty, OUSD(A&T)DTSE&E/DDSE
Phone: 703)695-2300
Email: fdoherty@acq.osd.mil
File Last Reviewed: Jul 96

Discretionary References

Army - AMC Pamphlet 70-27, Guidance for Integrated Product and Process Management
Vol II, Applications
    Section III. Integrated Product Team Life Cycle Responsibilities
        D. Engineering and Manufacturing Development, Phase II
            Worksheet IV, Phase II
                "Quality Assurance"
Vol III, Tools and Practices
    Section II IPPD Tools and Technologies,
        A.2. Modeling Tools and Techologies
            "Quality and costumer satisfaction..."

File Owner: HQ, AMC, ATTN: AMCRDA-TE
Owner Ph #: (703) 617-9078, DSN: 767-9078
File Last Reviewed: Jul 96

Quality Management Systems

GENERAL GUIDANCE

Traditional quality management systems have typically focused on the identification and control of hardware that fails to meet specified requirements. Although preventing nonconforming material from reaching the hands of the customer is a critically important function, the traditional quality assurance approach suffers from a number of drawbacks. Foremost among these is that identification and control of defects have proven to be much more costly than preventing their occurrence in the first place. Secondly, inspection and test—even when performed on a 100% basis—often fail to identify all existing nonconformances. Lastly, the use of end item inspection as a principal means of determining product acceptability has frequently led to the perception that workers who perform such inspections and tests—rather than those who design, fabricate, assemble and maintain the product—are responsible for product quality. This shift of responsibility away from those who design, fabricate, assemble and maintain the product, deters effective focus on the product and process design elements instrumental in achieving quality. Unlike the traditional quality approach to obtaining quality products which focused on conformance, product quality is an attribute that is controlled by the engineering/design and business processes, as well as maturation of the associated manufacturing/production process.

This changed view of quality resulted in the following major policy changes which have dramatically changed the DoD perspective on quality:

--SECDEF Memorandum of June 29, 1994, Specifications and Standards - A New Way of Doing Business, encourages use of commercial practices and requires contractors be given flexibility to identify their own quality system requirements. Achievement of quality requires an effective quality management process be employed in conjunction with effective business and technical practices. Achievement of quality requires engineering and manufacturing practices that emphasize robust design, along with enterprise-wide continuous process improvement efforts. Benefits include first time or first pass quality, decreased cycle time, as well as reductions in rework, engineering changes, and inspections. Defense contractors should be required to have a quality system which adheres, at a minimum, to the twenty elements described in ANSI/ASQC-9000. Such a system relies on assessment of the contractor's quality management process, process controls, inspection, and test.

--SECDEF Memorandum, dated May 10, 1995, entitled Use of Integrated Product and Process Development and Integrated Product Teams in DoD Acquisition, provides the framework for achieving quality products through integrated product and process development. Quality products are best achieved through integrated development of the product and its associated manufacturing and support processes, which is an integral part of systems engineering.. Quality must be an integral part of the work of integrated product teams and implementation of IPPD.

--SECDEF Memorandum, dated December 6, 1995, subject Common Systems/ISO-9000/Expedited Block Changes, and USD(A&T) memorandum, dated December 8, 1995, subject Single Process Initiative, provide policy on the use of single processes in a contractor's facility. These memos were intended, in part, to expedite the shift from military quality standards to commercial (ISO/ANSI/ASQC) standards. The goal is to preclude requiring, in a single facility, multiple quality, business or technical processes designed to accomplish the same purposes. The implementation of the single process initiative has coincided with the formulation of local management councils (consisting of representatives of the buying activities, ACO, DCAA and contractor) at affected contractor facilities to assess process issues. Contractor proposed implementation will be reviewed based on submission of concept papers. The program manager should support contractor efforts to implement a single quality management system throughout their facilities. This policy represents a major DoD initiative allowing industry to be more efficient, improve quality and reduce the overall cost of acquiring products.

USD (A&T) Memorandum of February 14,1994 entitled: Use of Commercial Quality System Standards in the Department of Defense requires contractors be given flexibility to identify their own quality system requirements and encourages use of a single quality process in a contractor's facility. The referenced MIL-HDBK-9000, however, is no longer valid due to the new policy of SECDEF memorandum of June 29, 1994, Specifications & Standards - A New Way of Doing Business, which encourages use of commercial practices and requires contractors be given the flexibility to identify their own management systems.

Achievement of quality requires an effective quality management process in conjunction with effective business and technical practices. Achievement requires engineering and manufacturing practices that emphasize robust design along with enterprise-wide process maturity through continuous process improvement efforts. Benefits include first time pass quality, decreased cycle time, as well as reductions in rework, engineering changes, and inspections. These benefits translate into improved affordability and reduced production transition risk. A basic quality management system should be a requirement of the contract, and should adhere, at a minimum, to the twenty elements described in ANSI/ASQC-Q9000. A basic quality management system relies on assessment of the contractor's quality management process, process controls, inspection, and test and is primarily focused on controlling and detecting manufacturing defects.

Unlike the traditional quality approach to obtaining quality product which focused on conformance, product quality is now viewed as an attribute that is controlled by the engineering/design and business processes, as well as the maturation of the associated manufacturing/production process.

Achievement of quality must be the underlying objective in all program matters including source selection, contract administration and supplier management, risk management, engineering, manufacturing and testing processes, etc.. Quality is the product of effective implementation of these processes. While final inspection and acceptance, and the need to determine the conformance of the product through end item inspection will continue as long as tax payers dollars are being spent, the focus on how to achieve quality has expanded to one of ensuring the appropriate use of best engineering, manufacturing and management practices.

To achieve quality products and services one must focus on the following:

(1) Quality of Design. The effectiveness of the design process in capturing the operational, manufacturing and quality requirements and translating them into robust design requirements that can be manufactured (or coded) and supported in a consistent manner.

(2) Conformance to Requirements. The effectiveness of the design and manufacturing functions in meeting the product requirements and associated tolerances, process control limits, and target yields for a given product group.

(3) Fitness for Use. The effectiveness of the design, manufacturing, and support processes in delivering a system that meets the operational requirements under all required operational conditions.

(4) Cost. The cost of the product and how the design, manufacturing, and management processes affect unit and life cycle costs

The following guidelines for establishing and maintaining an effective quality management program are discussed below:

1. Application and use of commercial quality management standards
2. Encouraging use of a single quality process in a contractor's facility
3. Recognizing and encouraging the appropriate use of practices and tools that lead to acquiring a quality product
4. Establishing and implementing efficient and effective oversight

APPLICATION AND USE OF COMMERCIAL QUALITY STANDARDS

Policy and guidance on the application of quality standards is provided in the FAR Part 46; DFARS Part 246; and SECDEF memorandum of 29 June 94, entitled "Specifications and Standards-A New Way of Doing Business"; and USD(A&T) memorandum of December 8, 1995, titled "Single Process Initiative"

DoD organizations are authorized to use ANSI/ASQC Q-9000, and/or the ISO-9000 series standards in all new contracts, and follow-on work for existing programs, provided contractors are given the flexibility to respond with their own equivalent quality systems. The ANSI/ASQC documents covered under ANSI/ASQC Q-9000 represent different levels of quality requirements outlined as follows:

ANSI/ASQC-Q9001 "Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing"

ANSI/ASQC-Q9002 "Quality Systems - Model for Quality Assurance in Production and Installation"

ANSI/ASQC-Q9003 "Quality Systems - Model for Quality Assurance in Final Inspection and Test"

ANSI/ASQC Q-9001, Q-9002 and Q-9003 are the U.S. equivalents and equal to the international quality standards ISO 9001, ISO 9002, and ISO 9003, respectively. The guidance herein applies equally to both the ANSI/ASQC Q-9000 series and the ISO-9000 series documents. Additional guidance on the non-government standards, such as ISO 10005, "Quality management - Guidelines for quality plans," is available through ISO 9000 and 10000 series documents listed the DoD Index of Specifications and Standards.

The elements of ANSI/Q-Q9000 represent a framework for a basic quality system, however, they should not be viewed as the only commercial quality specifications available, nor the most effective basic quality system requirements. Many other industry quality standards (i.e. the auto industries QS-9000) exist and are potentially more effective than the ISO or ANSI 9000 quality standards. It is therefore in the DoD policy to cite the DoD requirement with the words "or equivalent" to allow offerors the flexibility to propose their own equivalent quality system. Quality systems that satisfy DoD acquisition needs should be recognized whether they are modeled on military, commercial, national, or international standards.

The ANSI-9000 standards have a number of limitations in that they address the elements of a contractor's quality system, but do not address the application of such a system to the products or processes as related to a particular contract. This limitation can be overcome by use of the following statement of objective (SOO) language.

In implementing this guidance in competitive requests for proposals (RFPs) buying activities may consider the following suggested language for performance based statement of work (SOW) the statement of objectives (SOO), Section L, and Section M. (While the sample language that follows is structured for a development phase RFP, it is adaptable for production phase RFPs.)

<u>Suggested SOW/SOO language for a quality system requirement</u>. " The contractor shall implement a quality system that satisfies the program objectives and is modeled on ANSI/ASQC Q9001, or an equivalent quality system."

<u>Suggested Section L language</u>. "Offerors shall propose a quality system that satisfies program objectives and is modeled on ANSI/ASQC-9001, or an equivalent quality system." Offerors shall:

a) Describe the proposed quality system, explaining how it will be applied to reduce program risk, and specifically addressing (as a minimum) the quality system's role in design and development (with particular emphasis on addressing key product characteristics), manufacturing planning, and key program events.

b) Provide a relational matrix comparing, in detail, the proposed quality system with each of the elements of ANSI/ASQC-Q9001"

<u>Suggested Section M language</u> "The offeror's quality approach will be evaluated based on its effective:

a) application to all appropriate aspects of the program
b) coordination with other functions
c) integration into overall program planning; and
d) contribution to reduction of program risk."

The offeror's ability to satisfy the quality management system objectives should be assessed in source selection and continuously monitored after contract award. The elements of ANSI/ASQC-9000 formulate the baseline for review and approval of a contractors quality management process. In reviewing contractor quality management systems, particular emphasis should be given to management responsibility, supplier control, corrective and preventive action, and internal audit.

USE OF A SINGLE QUALITY PROCESS IN A CONTRACTOR'S FACILITY

DoD Policy on the use of single processes in a contractor's facility is provided in SECDEF memo, dated Dec. 6, 1995, subject Common Systems/ISO-9000/Expedited Block Changes, and USD(A&T) memo, dated Dec. 8, 1995, subject Single Process Initiative. These memos were intended, in part, to expedite the shift from military quality standards to commercial (ISO/ANSI/ASQC) standards. The goal is to preclude requiring, in a single facility, multiple quality, business or technical processes designed to accomplish the same purposes. The implementation of the single process initiative has coincided with the formulation of local management councils (consisting of representatives of the buying activity, ACO, DCAA and contractor) at affected contractor facilities to assess process issues. Contractor proposed implementation will be initiated based on submission of concept papers. The PM should support contractors' efforts to implement a single quality management system throughout their facilities.

The above policy represents a major DoD initiative allowing industry to be more efficient, improve quality and reduce overall cost of acquiring products.

RECOGNIZING AND ENCOURAGING THE APPROPRIATE USE OF ENGINEERING AND MANUFACTURING PRACTICES

As previously stated, the prevention of defects, rather than the detection of defects, is the goal of the Department. Advanced quality practices is a term identified by some in industry to mean the appropriate, timely application of engineering, manufacturing, and management practices that emphasize the prevention of defects, rather than detection of defects. Advanced quality practices need to be defined within an organizational context, not as a stand alone list. What may be appropriate for a design, or low rate production enterprise, may not be for a commodity manufacturer, and vice versa. Some of the more commonly used practices in industry include:

1. Identification and control of key characteristics
2. Design to manufacturing process capability
3. Design for manufacturing and assembly (DFMA)
4. Robust design
5. Geometric Dimensioning and Tolerancing
6. Process Variability reduction, of stable, capable manufacturing processes as the basis for product acceptance
7. Control of variation in the measurement system
8. Failure reporting analysis and corrective action system
9. Continuous improvement
10. Other tools such as use of modeling and simulation, CAD/CAE/CAM, and use of maturity models, etc.

While the requirement for a basic quality system is incorporated as a requirement into DoD contracts, the contractors ability to effectively implement the appropriate and effective application of the above type of development and manufacturing practices and tools to meet product requirements is fundamental to achieving quality products; i.e. products that meet the user requirements at an affordable cost.

ESTABLISHING AND IMPLEMENTING EFFECTIVE AND EFFICIENT CONTRACTOR SURVEILLANCE

The cognizant CAS activity verifies that contractors have processes and a quality system that meet contract quality requirements and produce quality products. In coordination with effected Program Manager Offices and buying commands, the CAS activity:

- Identifies critical processes
- Develops and maintains a written risk based surveillance plan
- Performs necessary surveillance
- Performs data analyses and adjusts surveillance accordingly

By working in coordination with each other, the Program Manager Offices/buying commands and the CAS activity can minimize the disruptive impact of DoD surveillance efforts on contractor operations, and reduce DoD's costs of surveillance.

The CAS activity derives confidence from credible contractor data when feasible, but performs sufficient product audits to maintain confidence in that contractor data. DCMC performs independent product audits to verify product conformance with contract technical and quality requirements. When contract non-compliances are observed, the CAS activity requests, evaluates, and verifies contractor corrective actions. The CAS activity also encourages contractors to self-audit and pursue process maturity and effectiveness, waste minimization and continuous improvement.Deficiency Reporting. DoD Components should establish a product deficiency reporting and correction system to track and record the status of the products ability to meet user requirements with feedback to the system developer. The contractor should implement a system that identifies the root cause of in-plant and field defects and promotes design/process changes necessary to prevent their recurrence.

The responsibility and leadership for creating an environment for effective quality design and manufacturing belongs to the highest levels of management. Program managers must convey the leadership and commitment by their own actions in communicating goals, making process effectiveness a key program management issue, and the commitment of resources.

File Owner: Frank Doherty, OUSD(A&T)DTSE&E/DDSE
Phone: 703)695-2300
Email: fdoherty@acq.osd.mil
Last Reviewed: Jul 96

Systems Acquisition Overview

The World Around Us Has Changed Dramatically - Need for Acquisition Reform

- Radically changed threat
  - DoD peace keeping actions around the world
- Defense budget outlook
  - Total budget projected to fall between 1985 and 1997
  - Most of the budget cuts will be in procurement, 60-65% by 1996-1997
- Rapid changes in technology development
  - In 1965 DoD's share of the semiconductor market was 75%, today 1%
  - DoD no longer drives technological innovation in many cases

SYS ACQ OVRVW/ 1/6141

World Changes Have Caused General Acquisition Process Changes

Past		**Today**
Many new systems	→	Few well-chosen force multipliers
Focus on nuclear warfare	→	Focus on conventional warfare (Peacekeeping & Humanitarian Operations)
Technology driven programs	→	Affordability driven programs
Service specific programs	→	Joint programs (within DoD and with our Allies)
Military unique technology	→	Dual-use or commercial technology
Technology development	→	Technology Insertion; reduction of cost

SYS ACQ OVRVW/ 2/6141

DoD Acquisition System Mission

- Establish affordable solutions to needed military capabilities; and
- Acquire products and services to meet those needs -
  – that will provide the best value to the Government over the life cycle of the product or service,
  – using the most efficient, timely, and effective acquisition strategy,
  – while supporting the nation's social policies, protecting the public trust, and fostering the development of an integrated National industrial and technology base composed of globally competitive U.S. suppliers

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Acquisition Reform Mandate for Change Vision

The DoD will institutionalize:

– business processes that facilitate timely delivery of "best-value" products and services that meet the warfighters' needs; and an environment for continuous process improvement; while supporting the nations social policies, protecting the public trust and fostering development of an integrated U.S. national industrial & technology base

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DoD Acquisition Reform Major Goals

- Enhance the needs (requirements) determination processes (what we buy)
- Improve the Systems Acquisition Process (how we buy)
- Improve the Procurement Process (how we buy)
- Improve Contract Administration (how we buy)
- Improve Government Contract Terms and Conditions (Legal, Pricing, and Finance issues) (under what terms and conditions we buy)
- Change the Culture
- Define Measures of Success - Metrics
- Enabling Actions

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DoD Acquisition Reform Goals and Execution / 1

Enhance the needs (requirements) determination processes (what we buy)

- Specs and Standards Reform - move to performance specs or, if not possible, commercial standards; use milspecs only with a waiver or exemption
- Enhance the integration of needs (Requirements) Determination, Resource Allocation (PPBS), and Acquisition Process

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DoD Acquisition Reform Goals and Execution / 2

Improve the Systems Acquisition Process (how we buy)

- Use commercial practices to acquire military-unique items as well as commercial items as appropriate
- Improve the Service and OSD Milestone Decision-making and Information Collection Processes for Major Systems
- Streamline and make more effective and realistic Developmental, Live-Fire, and Operational Testing
- Provide more funding flexibility (e.g. color of money) and stability to manage programs in the best manner possible
- Improve realism in project planning
- Reduce time-to-field systems and provide for infusion of new technology
- Improve management of Joint Service programs
- Improve management of Cooperative and Foreign Military Sales programs

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DoD Acquisition Reform Goals and Execution / 3

Improve the Procurement Process (how we buy)

- Adopt internal Best Practices: ensure that DoD emulates best procurement practices of world-class customers and suppliers
- Use technology to enable Re-engineering: make maximum use of technology to facilitate and enable Re-engineering of the Acquisition Process
- Improve software procurement process
- Ensure better cost, schedule, and performance adherence for Major Systems
- Develop a new method of pricing non-competitive contracts
- Provide better incentives for managing long-term sole source contracts

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DoD Acquisition Reform Goals and Execution / 4

- Improve Contract Administration (how we buy)
  - Shift from inspection to process control to results orientation
  - Ensure oversight and review of contractor management add value and are minimally obtrusive
- Improve Government Contract Terms and Conditions (Legal, Pricing, and Finance issues) (under what terms and conditions we buy)
  - Eliminate, to the maximum extent practical, Government-unique terms and conditions
  - Foreign contracting and contingency operations: update laws regarding contingencies, the lending/borrowing of defense equipment and “war risk” to contractor personnel
  - Reduce disputes: reduce bid protests and claims and streamline the process for addressing them within DoD

SYS ACQ OVRVW/ 9/6141

DoD Acquisition Reform Goals and Execution / 5

Change the Culture

- Increase the quality and effectiveness of the Acquisition Workforce
- Make both Federal and DoD acquisition regulations and DoD system acquisition policies better <u>facilitate</u> the Acquisition Process
- Balance gains to further a Government interest vs. the cost to implement: can’t afford “perfect system”
- Build an environment for continuous process improvement
- Utilize Integrated Decision/Integrated Product and Process Development Teams
- Improve supplier involvement
- Make DoD organizations participants, not inspectors
- Ensure that DoD activities do not request information of other DoD activities or DoD contractors unless absolutely necessary
- Make acquisition system more flexible, timely and responsive
- Empower the Acquisition Workforce

SYS ACQ OVRVW/ 10/6141

DoD Acquisition Reform Goals and Execution / 6

- Define Measures of Success - Metrics
  - Establish clear measurements of system responsiveness and metrics to determine success of change efforts
- Enabling Actions
  - Establish step-by-step plan of action to implement and institutionalize Acquisition Reform

WE MUST TAKE ADVANTAGE OF THE OPPORTUNITY, THE REVOLUTION HAS BEGUN!

Six Major Themes to the DoD 5000 Update / 1

1. Teamwork (cross-functional teams)

   Must work together as a team to build successful programs , identify problems early and maintain a cooperative spirit of resolution
2. Tailoring

   MDAs should tailor most aspects of the acquisition process, including program documentation, acquisition phases and the timing, scope and level of decision reviews
3. Empowerment

   5000 series empowers program managers and their vendors to do the best they can

Six Major Themes to the DoD 5000 Update / 2

4. Cost as an Independent Variable (CAIV)

   Cost must be an independent variable in programmatic decisions with responsible cost objectives set for each program phase

5. Commercial Products

   Acquisition of commercial items, components, processes and practices provides rapid and affordable application of new technologies and enables an open-system architecture for increased flexibility throughout the life cycle

6. Best Practices

   Acquisitions of the future must take into account customary commercial practices in developing acquisition strategies and contracting arrangements. Performance-based specifications are an enabler.

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Themes versus Enablers Matrix

Themes	Teamwork	Tailoring	Empower-ment	CAIV	Commercial Products	Best Practices
Enablers (Acquisition Reform Initiatives)	IPPT/IPT	Open System Approach	IPPD/IPT	IPPD/IPT	Open System Approach	Open System Approach
		Statement of Objectives		Minimize Support Costs	Technology Insertion	Statement of Objectives
		Perf-based Specs		Affordability	ATDs / ACTDs	Perf-based Specs
		Single Process		Modeling & Simulation	Single Process	Single Process
		Non-Govt Specs / Stds Preference		Reduce Cycle Times	Non-Govt Specs / Stds Preference	Non-Govt Specs / Stds Preference
		Best Value Contracting			Perfm. Market Survey	Best Value Contracting
					Use NDI	Use NDI
					Use COTS	Use COTS
					Performance -based specs	Modeling & Simulation
						Contractor Past Perf.

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Performance Based Statement of Work

SOW based on a performance spec that is not directive in nature (Army)

Statement of Objectives - government writes overall objectives, contractor writes SOW based on those performance requirements

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15/6141

Cost As an Independent Variable (CAIV)

Theme is to drive costs down by aggressively managing costs.

Five main thrusts:

- Set realistic, objective cost objectives.
- Manage risks to achieve cost, schedule, performance objectives.
- Devise and use appropriate cost metrics
- Incentivize government and industry managers to achieve program goals
- Incentivize to reduce operating and support costs for fielded systems.

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16/6141

Cost As an Independent Variable (CAIV)
(Continued)

- Cost goals should be lower than with old way of doing business.
- Use incentives in RFI, RFP, contracts.
- Do cost performance trade-offs.
- Get user involved in trade-offs.
- Get user to prioritize capabilities of system.
- Maximize PM and contractor's ability to make cost/performance trade offs.
- Manage risks by using existing processes.
- Develop metrics and observables to measure progress in cost area.
- Initiate discussion to evaluate impact of these ideas.

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17/6141

What is the Single Process Facility Initiative?

DoD Contractors provide products to each service, Defense agency, other Government and industry customers

- Currently operate under multiple Specs and Standards to accomplish s<u>ame results</u>

Common Specification and Standards Can:

- Facilitate common processes
- Increase efficiency by allowing ownership and flexibility to improve processes
- Facilitate contractor adoption of Best Commercial Practices
- Reduce requirements for training and documentation
- Can result in improved quality, reduced cycle time & cost

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18/6141

DoD 5000.2-R para. 4.3.4

Open Systems Design

"An open systems approach shall be followed for all system elements (mechanical, electrical, software, etc.) in developing systems. This approach is a business and engineering strategy to choose specifications and standards adopted by industry standards bodies or de facto standards (set by the market place) for selected system interfaces (functional and physical), products, practices and tools. Selected specifications shall be based on performance, cost, industry acceptance, long term availability and supportability, and upgrade potential. For all C^4I systems, information systems, and weapon systems that must interface with C^4I systems or information systems, mandatory requirements are contained in the Technical Architecture Framework for Information Management (TAFIM)"

SYS ACQ OVRVW/ 19/6141

Why Open Systems Engineering?

- Use of commercial components reduces component development costs
- Mandate to use Commercial Products and Practices to the maximum extent practicable
  - Commercial products are market controlled
- Vendor support of commercial products is short lived
- Use of Open Systems Engineering
  - Manages commercial component volatility
  - Supports vendor and technology independence
  - Promotes portability, interoperability, reusability, etc.
  - Critical to operational system maintenance
  - Able to build and maintain (adapt) functional performance much more affordably, throughout the life of the system
- DoD cannot support a military unique industrial base

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Quality Guru's

JURAN: Quality is "Fitness for Use"

- Quality of Design (Engineering)
- Quality of Conformance (Manufacturing)
- Availability (Logistics)

CROSBY: Quality is "Conformance to Requirements"

- Prevention System not Detection
- "Do it Right the 1st Time"
- Measurement is the "Price of Nonconformance -= (COQ)"

YOUR DEFINITION:

GIVE ME A CORPORATE DEFINITION:

JURAN's

Universal Sequence for Breakthrough

- Proof of Need
- Project Identification: Pareto
- Organization to Guide Projects
- Organization for Diagnosis
  - For Analysis of Projects
- Breakthrough in Results
  - Remedial Action on the Findings
- Breakthrough in Cultural Resistance to Change
- Control at the New Level

CROSBY's 14 - Steps

- Management Commitment
- Quality Improvement Teams
- Quality Measurement
- Cost of Quality Evaluation
- Quality Awareness
- Corrective Action
- Establish an Ad Hoc Committee for the Zero Defects Program
- Supervisor Training
- Zero Defects Day
- Goal Setting
- Error Cause Removal
- Recognition
- Quality Councils
- Do It Over Again

DEMING's 14 - POINTS

- Constancy of Purpose
- New Philosophy
- Cease Dependence on Inspection
- End Primacy of Price
- Constantly Improve
- Train on the Job
- Helpful Leadership
- Drive out Fear
- Remove Barriers
- No Slogans or Targets
- No Work Standards
- Pride of Workmanship
- Self-Education & Improvement
- Involve Everyone

7 - DEADLY DISEASES

- Lack Constancy of Purpose
- Emphasis on Short-Term Profit
- Evaluation by Performance, Merit Rating, or Annual Performance Review
- Mobility of Management
- Running a Company on Visibility Figures Alone

for USA only:

- Excessive Medical Costs
  Excessive Costs of Warranty, Fueled by Lawyers Working on Contingency Fees

- **IS QUALITY IMPORTANT TO DOD?**
- **HOW DOES DOD DETERMINE/ASSURE QUALITY?**

QUALITY PARADIGM

OLD **NEW**

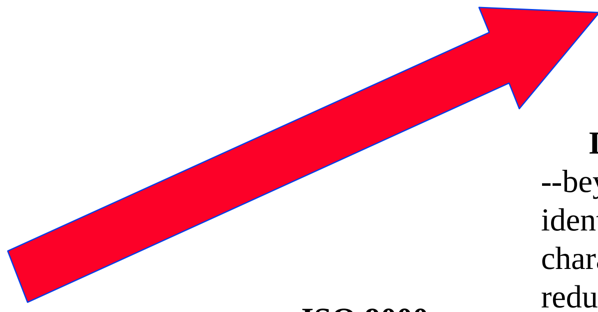
The QA Environment

Little "q"

- **Quality is "Quality's Responsibility"**
- **Focused on:**
  - Product Characteristics
  - In-Process Inspections
  - Testing
  - End Item Inspection
  - Field Performance
- **Inspection Oriented**
  - Find it and Fix it
- **Cost & Schedule**
  - First, Last & Forever

Big "Q"

- **Quality is Everyone's Responsibility**
- **Focused on:**
  - Multi-functional teams
  - Manage the process
- **Prevention Oriented**
  - Design Quality in
  - Build Quality in
  - Identify High Cost Drivers
  - Eliminate Root Causes
  - Work for Continuous Improvement
- **Big Q" = Cost, Schedule & Performance**



EXCELLENCE IN PRODUCTS AND SERVICES

D1 9000
--beyond ISO and identifies key characteristics and reduces varaition

ISO 9000
-- customer satisfaction by preventing non-conformity ...

Mil-Q-9858A
-- adequate quality throughout all areas of contract performance.

QUALITY POLICY DEPLOYMENT

- **THE "BOARD ROOM"**
  - Guiding Principles
  - Policies
  - Philosophical Doctrine
- **MANAGEMENT**
  - Methods
  - Approaches
  - Practices
  - Procedures
- **THE "FACTORY FLOOR"**
  - Metrics
  - Measurements

LIPS —— **FEET** —— **RESULTS**

NEW ENGINEERING PARADIGM

<u>SEQUENTIAL</u> **<u>IPPD</u>**

Impacts

- **DoD needs to be able to evaluate contractor proposed systems & processes**
- **SPI - Single Process Initiative**
  - **Contractor proposed systems & processes will be proposed. What are your roles, responsibilities, and concerns about evaluating these proposals?**

OTHER GURU'S

JOEL BARKER: The Power of Paradigms

JAMES LAMPRECHT: ISO 9000

PETER SCHOLTES: The Team Handbook

DR. MYRON TRIBUS: Quality in Education

ELIYAHU GOLDRATT: The Goal

WILLIAM SCHERKENBACH: The Deming Route

KEN BLANCHARD: The One Minute Manager

WILLIAM DAVIDOW: The Virtual Corporation

CURT REIMANN: NIST Baldrige Director

STEPHEN COVEY: 7 Habits of Highly Effective People

William Conway, Tom Peters, Donald Wheeler, Robert Amsden, William Glasser, Keki Bhote, Peter Senge, Carla O'Dell, Michele Hunt, Jack Zenger. et al.

ADVANCED PRODUCTION & QUALITY MANAGEMENT

LESSON PLAN

Course Number: PQM 301

Module & Title: Lesson No. 3, Systems Acquisition Overview

Length (total): 2.0 Hours

Terminal Learning Objective:

Show the current systems acquisition life cycle phases as well as major activities to be accomplished within the acquisition management system framework. This lesson introduces the requirements generation or pre-milestone 0 activities, the systems acqusition life cycle phases and the current DoD 5000 series directive and regulation guidance. These will be referenced throughout the course to establish the time frame of topics covered.

Enabling Learning Objectives:

1. Differentiate the requirements generation system and the program, planning, and budgeting system to the acquisition management system. These three decision-making systems are used in the DoD pre-milestone 0 and program execution acquisition stages. The breadth of each of these systems and their interrelationships are discussed. Application knowledge of these decision-making systems are important to the SPRDE functional area.

2. Distinguish between the different life cycle activities and their interrelationships. The life cycle activities (from ACQ 201) will be discussed and the changes brought about by the current 5000 series documents that impact the life cycle for the development, production, and support of a system.

Learning Method: Expository Discussion

Student Readings: None

Instructor Readings: "Acquisition of Defense Systems," Przemieniecki, Chap. 2,3,7, Chap 10, pp. 177-203. Chap. 13, pp. 85,86, and pp. 243-257.

Background References: DoDD 5000.1 (Mar 15, 1996)

DoD 5000.2-Regulation (Mar 15, 96)
Process Action Team on Military Specifications and Standards Report recommendations (Report #AD-A 278 102)
EIA IS-632/IEEE 1220
Federal Acquisition Streamlining Act (FASA)
"Specifications & Standards - New Way of Doing Business" memo of Dr. Perry's dtd 29 Jun 94
MOP-77
Cost as an Independent Variable (CAIV) memo dtd 4 Dec 95

Conduct of the Lesson:

This lesson is conducted by expository discussion where appropriate. The TLO is accomplished in two major parts - Requirements Generation and Acquisition Life Cycle.

The Requirements Generation portion of this lesson will focus on the pre-milestone activities leading up to the Mission Need Statement and will be a review of some of the material presented in the ACQ 201. Emphasis is placed on how this process can lead to the development of materiel solutions to meet user requirements. The interrelationships of the three decision-making support systems - Requirements Generation; Planning, Programming, & Budgeting; and Acquisition Management will be emphasized.

The Acquisition Life Cycle portion of this lesson will present pertinent changes being introduced by the current DoDD 5000.1 and DoD 5000.2-R. The acquisition "chain of command" and acquisition categories will also be discussed.

Systems Acquisition Overview

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APQMC LEVEL III

Systems Acquisition Overview

- Acquisition Reform
- Planning Programming and Budgeting System
- Requirements Generation
- Acquisition Management

SYS ACQ OVRVW/ 2/6141

Systems Acquisition Overview

Themes versus Enablers Matrix

Themes	Teamwork	Tailoring	Empower-ment	CAIV	Commercial Products	Best Practices
Enablers (Acquisition Reform Initiatives)	IPPT/IPT	Open System Approach	IPPD/IPT	IPPD/IPT	Open System Approach	Open System Approach
		Statement of Objectives		Minimize Support Costs	Technology Insertion	Statement of Objectives
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		Best Value Contracting			Perfm. Market Survey	Best Value Contracting
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					Use COTS	Use COTS
					Performance -based specs	Modeling & Simulation
						Contractor Past Perf.

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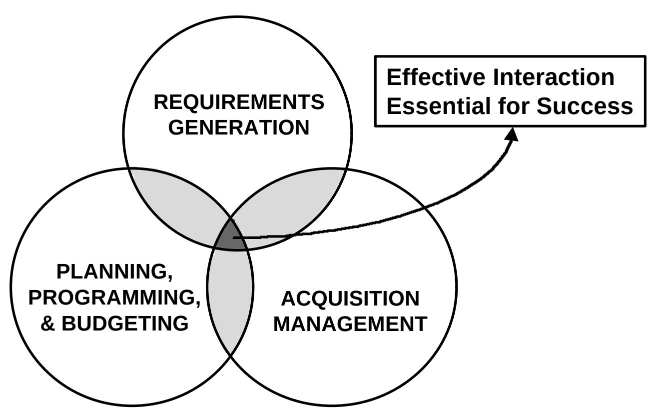
Requirements Generation Process
Three Decision-Making Systems



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Interrelationships of Decision-Making Systems

- Acquisition Management:
  - Management of all or any of the activities within the broad spectrum of "acquisition". Also includes management of the training of the defense acquisition workforce, and management activities in support of PPBS for defense acquisition systems / programs. For acquisition programs this term is synonymous with program management.
- Planning, Programming, and Budgeting System (PPBS):
  - The primary resource allocation process of DoD. It is a formal, systematic structure for making decisions on policy, strategy, and the development of forces and capabilities to accomplish anticipated missions. PPBS is a cyclic process containing three distinct, but interrelated phases: planning, programming, and budgeting

SYS ACQ OVRVW/ 5/6141

Interrelationships of Decision-Making Systems / 2

Requirements Generation:

- Process which leads up to the development of the Mission Needs Statement
  - » Includes assessment of alternatives in an operational context
  - » Includes assessing warfighting deficiencies and technological opportunities for increased system effectiveness
- Requirements defined:
  - » (1) The need or demand for personnel, equipment, facilities, other resources, or services, by specified quantities for specific periods of time or at a specified time.
  - » (2) For use in budgeting, item requirements should be screened as to individual priority and approved in the light of total available budget resources.

The PM is knowledgeable of and understands how to operate within the constraints imposed by the requirements generation system, the acquisition management system and the PPBS

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Systems Acquisition Overview

Planning Programming and Budgeting System (PPBS) / 1
Planning Phase

CJCS

Joint Strategy Review / National Military Strategy

↓

Joint Staff: Joint Planning Document → SECDEF: Defense Planning Guidance

PURPOSE: Determine threat and recommend forces needed to counter it

SYS ACQ OVRVW/ 7/6141

Planning Programming and Budgeting System (PPBS) / 2
Programming Phase

Services	Services	Joint/ OSD Staffs	SECDEF	
POM Build →	Program Objectives Memoranda (POM) (FYDP)* →	Issue Papers →	Program Decision Memoranda →	Approved POM
Feb-May	Jun	Jun-Aug	Aug-Sep	

PURPOSE: Determine what personnel, materiel, & facilities are needed to execute strategy.

* Future Years Defense Program data base updated

SYS ACQ OVRVW/ 8/6141

Planning Programming and Budgeting System (PPBS) / 3
Budgeting Phase

Services	OSD / OMB	OSD	SECDEF
Budget Estimate Submit (FYDP)* →	Budget Review Hearings →	Program Budget Decisions →	DoD Budget Request (FYDP)*
Sep	Sep-Nov	Nov-Dec	Feb

PURPOSE: Request funds to implement programs and accomplish mission.

* Future Years Defense Program data base updated

SYS ACQ OVRVW/ 9/6141

Requirements Generation Process / 1
Milestone 0 - Concept Studies Approval

1
Definition
(MAA / MNA)

2
Documentation
(MNS)

3
Validation
(JROC / Component)

4
Approval

Milestone 0 Review

- **Defines number of study alternatives**
- **Establishes exit criteria**
- **Approves entry into Phase 0**
- **Documented in ADM**

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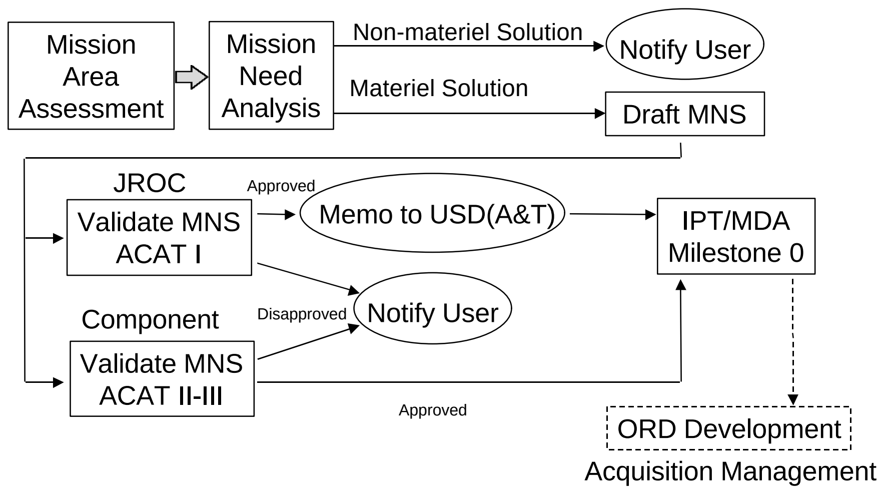
Requirements Generation Process / 2



Requirements Generation Summary

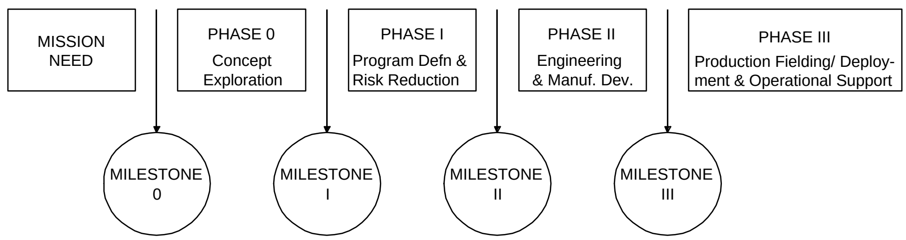
Requirements Generation Process

- Definition
  - Mission Area Assessment (strategy-to-task).
  - Mission Need Analysis (task-to-need).
- Documentation
  - Mission Need Statement.
  - Operational Requirements Document (ORD)
- Validation
  - Joint Requirements Oversight Council /Components
- Approval (Milestone 0 Review)
  - IPT / ADM.

Systems Acquisition Overview

Systems Acquisition Process

Acquisition Life Cycle Overview



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Acquisition Phases / 1

- Phase 0: Concept Exploration
  - Define & evaluate the feasibility of alternative concepts
  - Define in terms of initial, broad objectives of cost, schedule, performance...
- Phase I: Program Definition and Risk Reduction
  - Further definition and evaluation of selected concepts
  - Prototyping, demonstrations and early operational assessments to reduce risk
  - Evaluate cost drivers

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Acquisition Phases / 2

- Phase II: Engineering and Manufacturing Development
  - Translate into stable, producible, supportable and cost effective design
  - Validate the manufacturing processes
  - Demonstrate capabilities
  - LRIP
- Phase III: Production, Fielding/Deployment, and Operational Support
  - Achieve operational capability
  - Resolve deficiencies and verify fixes

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System Acquisition Process Acquisition Categories (ACATs)

ACAT	Criteria	Milestone Decision Auth.
I	Designated by USD(A&T) RDT&E $355M (1996) Procurement $2.135B (1996)	1D - USD(A&T) 1C - DoD Component Head
IA	Designated by ASD(C^3I) Single Year $30M (1996) Total Program $120M (1996) Total LCC $360M (1996)	1AM - OSD Chief Info Off 1AC - Component Chief Info Off
II	Designated by Head RDT&E $140M (1996) Procurement $645M (1996)	DoD Component Head or delegated
III	Others so designated	Lowest level appropriate

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USD(A&T) Chain of Authority

Packard Model for “Program Matters”	Responsibilities
USD(A&T) DAE	**Establishes DoD policy for procurement/R&D** **Administrative oversight; audit** **Supervises component acquisition system**
CAE	**Supervises component acquisition process** **Establishes acquisition policy** **Appoints PEOs** **Approves baselines**
PEO	**Oversees program execution** **Screens staff reviews** **Reports only to CAE for program matters** **Reviews baselines**
PM	**Executes program** **Reports only to PEO for program matters** **Formulates baseline**

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Acquisition Management
Summary

- Requirements Generation (Pre-Milestone 0)
- Life Cycle Phases
  - Concept Exploration (Phase 0)
  - Program Definition & Risk Reduction (Phase I)
  - Engineering & Manufacturing Development (Phase II)
  - Production, Fielding, Deployment & Operational Support (Phase III)
- Acquisition Categories
- Chain of Authority

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Systems Acquisition Overview Summary

- Acquisition Reform
  - "New Way of Doing Business"
- PPBS
  - Laying the framework
- Requirements Generation
  - Development of the Mission Needs Statement
- Acquisition Management
  - Phase and Milestone activities

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